Section 12 – Troubleshooting

Section Contents

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Troubleshooting Procedures and Techniques

General information

This guide describes some typical engine operating problems, their causes, and some acceptable corrections to those problems.

WARNING

Performing troubleshooting procedures NOT outlined in this in Section can result in equipment damage or personal injury or death.

Troubleshooting must be performed by trained, experienced technicians.

Consult a Cummins Authorized Repair Location for diagnosis and repair beyond that which is contained in this manual, and for symptoms not listed in this in section.

Before beginning any troubleshooting, refer to the General Safety Instructions in Section 1 of this manual.

Follow the suggestions below for troubleshooting:

Study the complaint thoroughly before acting.

Refer to the Engine Identification diagrams in Section 2, the System Diagrams in Section 6, and the Assembly Drawings in Section 13.

Do the easiest and most logical things first.

Find and correct the cause of the complaint.

Troubleshooting Symptoms Charts

WARNING

Troubleshooting presents the risk of equipment damage, personal injury or death Troubleshooting must be performed by trained, experienced technicians.

Use the charts on the following pages of this section to aid in diagnosing specific engine symptoms.

Read each row of blocks from top to bottom.

Follow through the chart to identify the corrective action.

Alternator Overcharging with the Engine Running

NOTE: If the batteries are overcharged while the engine is not running, troubleshoot the customer supplied battery charging system.

Cause	Correction
Batteries have failed.	Check the condition of the batteries. Replace any defective batteries.
	
The internal voltage regulator in the alternator is malfunctioning.	Test the alternator electrically. Refer to Alternator Checks and Testing in Section 7. If required, replace the alternator. Refer to Alternator Removal/Installation Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Neither Battery is Charging with the Engine Running

NOTE: If one or both batteries do not charge with the engine stopped, troubleshoot the customer supplied battery charging system.

NOTE: If only one battery is maintaining charge, go to Only One Battery is Charging with the Engine Running.

Cause	Correction
Battery cables or connections are loose, broken, or corroded (excessive resistance).	Check the battery cables and connections. Ensure that all connections are free of corrosion and that no cables are broken.
	
Alternator rotor is not turning.	Test the alternator mechanically. Refer to Alternator Checks and Testing in Section 7. If the alternator shaft does not spin freely because of a bad bearing, replace the alternator (refer to Alternator Removal/Installation in Section 7). If the alternator does not turn because of a bad drive belt, replace the drive belt (refer to Belt Removal/Installation in Section 7). If the alternator does not charge because of poor drive belt tension, adjust belt tension (refer to Adjust Alternator Drive Belt Tension in Section 7). If the alternator pulley spins freely on the shaft because of a broken key, replace the alternator (refer to Alternator Removal/Installation in Section 7).
	
Battery Isolator input has faulted.	Test continuity from the alternator to the battery isolator input (refer to Drawing 10423 Sheet 2 in Section 13). Repair any open circuit. Test continuity through the battery isolator. If an internal open circuit is detected, replace the battery isolator (refer to Battery Isolator Removal/Installation in Section 7).
	

Neither Battery is Charging with the Engine Running (Cont)

Cause	Correction
Alternator excitation is lost.	Test the alternator electrically. Refer to Alternator Checks and Testing in Section 7. If required, replace the replaceable diode. Refer to Drawing 10423 Sheet 1 in Section 13. If required, locate and repair the open circuit or short to ground in the alternator excitation wiring.
OK	
Alternator internal voltage regulator is malfunctioning.	Test the alternator electrically. Refer to Alternator Checks and Testing in Section 7. If required, replace the alternator. Refer to Alternator Removal/Installation Section 7.
OK	
Battery temperature is above specification.	Position the batteries away from heat sources.
OK	
Contact an Authorized Cummins Repair Facility.	

Only One Battery is Charging with the Engine Running

NOTE: If one or both batteries do not charge with the engine stopped, troubleshoot the customer supplied battery charging system.

NOTE: If neither battery is maintaining charge, go to Neither Battery is Charging with the Engine Running.

Cause	Correction
Battery has failed.	Test battery condition. Refer to Battery Testing in Section 7. If the battery has failed, replace the failed battery units. Refer to Battery Removal/Installation in Section 7.
	
Battery cables or connections are loose, broken, or corroded (excessive resistance).	Check the battery cables and connections. Ensure that all connections are free of corrosion and that no cables are broken.
	
Battery isolator has failed.	Remove the battery isolator. Refer to Battery Isolator Removal/Installation in Section 7. Test the internal diodes for open circuit or short to ground. Refer to the Schematic, Electrical Wiring, 10423 Sheet 2 Section 13. If required, obtain a replacement battery isolator (Cummins Part No. 8838). Install the battery isolator. Refer to Battery Isolator Removal/Installation in Section 7.
	
Voltmeter is providing false indication.	Go to Voltage Indications Differ in this section.
	
Contact an Authorized Cummins Repair Facility.	

Voltage Indications Differ

NOTE: The two voltmeters may differ slightly due to calibration differences between the meters. Normal differences in battery condition may also cause differences in indication. These are normal differences and require no action. A voltage difference of more than three or four volts should be investigated.

Cause	Correction
One battery is discharged or failing.	Check battery condition. Replace failing battery elements. Check wiring for corrosion. Ensure good electrical contact. Charge discharged batteries by running the engine or with an external battery charger. If the battery does not charge with the engine running, go to Only One Battery is Charging with the Engine Running.
OK	
Fuse 1 or Fuse 2 is open. (Refer to Drawing 10423 Sheet 1 in Section 13).	Check for apparent wire damage or shorts to grounds. Replace the failed fuse. Refer to Fuse Replacement in Section 7. If the fuse operates again, locate and correct the overload or repair the short circuit.
OK	
Open circuit or short to ground in indicator wiring.	Locate and repair the electrical fault. (Refer to Drawing 10423 Sheet 1 in Section 13).
OK	
Voltmeter has failed.	Remove wiring at the voltmeter and apply test voltage. If necessary, replace the faulted voltmeter. Refer to Voltmeter Removal/Installation in Section 7.
OK	
Contact an Authorized Cummins Repair Facility.	

Coolant Contamination

Cause	Correction
Coolant is rusty and has debris.	Drain and flush the cooling system. Refer to Drain and Flush Cooling System in Section 5. If the drained coolant has excessive rust or debris, change the coolant more frequently or contact a Cummins Authorized Repair Facility. Otherwise, refill with correct mixture of antifreeze and water. Refer to Drain and Flush Cooling System in Section 5.
	
Lubricating oil cooler is leaking oil into the coolant. Coolant begins to have the texture and color of chocolate pudding.	Drain and flush the cooling system. Refer to Drain and Flush Cooling System in Section 5. Check the lubricating oil cooler for coolant leaks and cracks. Refer to Lubricating Oil Cooler Removal/Installation in Section 7. Replace the oil cooler gasket or other parts. Refill with correct mixture of antifreeze and water. Refer to Drain and Flush Cooling System in Section 5. If the problem persists, the cylinder block may be cracked or porous. Refer to a Cummins Authorized Repair Facility.
	

Coolant Contamination (Cont)

Cause	Correction
Coolant Heat Exchanger is leaking raw water into the coolant. Coolant volume increases and pressure is relieved when the unit is operating. Antifreeze concentration decreases.	Drain and flush the cooling system. Refer to Drain and Flush Cooling System in Section 5. Remove Coolant Heat Exchanger. Refer to Coolant Heat Exchanger Removal/Installation in Section 7. Perform a pressure test of the raw water side of the heat exchanger. Refer to Coolant Heat Exchanger Removal/Installation in Section 7. If the heat exchanger leaks, it should be replaced. Install a known good Coolant Heat Exchanger. Refer to Coolant Heat Exchanger Removal/Installation in Section 7. Check and adjust raw water pressure regulator setpoints. Refer to Raw Water Piping, Lineup, and Configuration in Section 3. Check and, if required, replace the Zinc Plug. Refer to Inspect Heat Exchanger Zinc Plug in Section 5. Refill with correct mixture of antifreeze and water. Refer to Drain and Flush Cooling System in Section 5.
OK	
Coolant is inadvertently contaminated with unknown liquids.	Drain and flush the cooling system. Refill with correct mixture of antifreeze and water. Refer to Drain and Flush Cooling System in Section 5.
OK	
Contact an Authorized Cummins Repair Facility.	

Excessive Coolant Loss

Cause	Correction
Adequate coolant was not added following previous maintenance activities.	Check the coolant level. Refer to Check Coolant Level in Section 5. Add coolant as required and check engine operation. If coolant loss persists, check for other problems.
OK	
Inadvertent coolant leak is present.	Inspect the engine for coolant leaking from drain cocks or vents. Close the leaking drain or vent. Add coolant as required and check engine operation.
OK	
Cooling system hose is leaking.	Inspect the hoses. Refer to Check Hose Condition in Section 5. Replace and/or tighten loose hose clamps. Replace any damaged hoses. Refer to Coolant Hose Removal/Installation in Section 7. Add coolant as required and check engine operation.
OK	
Pressure cap (Cummins Fire Power Part No. 11407) is malfunctioning or has low-pressure rating.	Check that the pressure cap does not relieve coolant under normal operating conditions. Replace a leaking pressure cap. Add coolant as required and check engine operation.
OK	
Mechanical coolant leak.	Inspect the engine for coolant leaking from manifold, expansion and pipe plugs, fittings, lubricating oil cooler, water pump seal, cylinder block, and other components that have coolant flow. Repair leaking components. Add coolant as required and check engine operation.
OK	

Excessive Coolant Loss (Cont)

Cause	Correction
Engine is overheating.	Refer to the Coolant Temperature Above Normal symptom tree.
	
Refer to a Cummins Authorized Repair Facility.	

Coolant Temperature Above Normal

NOTE: The thermostat's normal operating temperature range is 82-95 °C [180-203 °F]. The High Water Temperature lamp on the local control panel (see Instrument Panel in Section 2) illuminates at 93 (92-94)°C [200 (198-202)°F]. The lamp will only illuminate if the engine is running. If the lamp is illuminated or if temperature is otherwise excessive, the engine should be stopped as soon as practical and the problem corrected.

Cause	Correction
Raw water flow is improperly aligned.	Check that the raw water manifold is aligned for normal flow through the solenoid valve (preferred) or bypass flow around the solenoid valve (alternative). (Refer to Drawing 8682 in Section 13). Align flow if required.
OK	
Raw water pressure regulator is improperly adjusted.	**NOTE**: Pressure should be about 414 kPa [60 psig] or slightly less. Check the raw water pressure indication. If pressure is indicated but is low, adjust the regulator (Refer to Check Raw Water Pressure Regulator Setpoints in Section 3.) If pressure is not indicated or is excessively low, go to Raw water solenoid has failed in this table.
OK	
Raw water solenoid has failed.	If pressure is excessively low when aligned for normal flow, open the bypass valves. Then, when practical, troubleshoot the raw water solenoid valve. Refer to Raw Water Solenoid Valve Fails to Operate in this section. If the solenoid valve operates, replace the pressure regulator. (Refer to Raw Water Pressure Regulator Removal/Installation in Section 7.) If pressure is excessively low when aligned for bypass flow, open the normal valves. Then, when practical, replace the pressure regulator. (Refer to Raw Water Pressure Regulator Removal/Installation in Section 7.)
OK	

Coolant Temperature Above Normal (Cont)

Cause	Correction
Raw water piping or heat exchanger is plugged.	Check the raw water strainer for blockage. Refer to Drawing 8682 in Section 13. Clean the strainer if necessary. Check the Cummins supplied raw water piping for blockage. Refer to Drawing 8682 and Drawing 9636 in Section 13. Clean the piping if necessary. Check the customer supplied raw water piping for blockage. Remove any blockage. Check for flow through the heat exchanger. If necessary, replace the heat exchanger. Refer to Coolant Heat Exchanger Removal/Installation in Section 7.
	
Coolant level is below specification.	Check the coolant level. Refer to Check Coolant Level in Section 5. Add coolant as required. If coolant level was excessively low, go to Excessive Coolant Loss in this section.
	
Cooling system hose is collapsed or restricted.	Inspect the hoses. Refer to Check Hose Condition in Section 5. Replace any damaged hoses. Refer to Coolant Hose Removal/Installation in Section 7.
	
Coolant thermostat is malfunctioning.	Remove and test the coolant thermostat. Refer to Coolant Thermostat Removal/Installation in Section 7. Replace the thermostat if it is defective.
	
Coolant water pump is malfunctioning.	Remove and inspect the water pump. Refer to Coolant Water Pump Removal/Installation in Section 7. Replace the thermostat if it is defective.
	

Coolant Temperature Above Normal (Cont)

Cause	Correction
Lubricating oil is contaminated with coolant or fuel.	Check the appearance of the lubricating oil. If the color and texture is abnormal, refer to the Lubricating Oil Contaminated symptom tree.
OK	
Cooling system hose is collapsed, restricted, or leaking.	Inspect the hoses. Refer to Check Hose Condition in Section 5. Replace any damaged hoses. Refer to Coolant Hose Removal/Installation in Section 7.
OK	
Coolant mixture of antifreeze and water is not correct.	Verify the concentration of antifreeze in the coolant. Refer to Check Cooling System Condition in Section 5. Add antifreeze or water to correct the concentration. Refer to Coolant Recommendations and Specifications in Section 10.
OK	
Lubricating oil level is above or below specification.	Check the oil level. Refer to Check Engine Oil Level in Section 5. Add or drain oil, if necessary.
OK	
Coolant temperature sender is malfunctioning.	Replace the temperature sender. Refer to Coolant Temperature Sender Removal/Installation in Section 7.
OK	
Coolant temperature gauge is malfunctioning.	Replace the temperature gauge. Refer to Coolant Temperature Gauge Removal/Installation in Section 7.
OK	

Coolant Temperature Above Normal (Cont)

Cause	Correction
Coolant temperature switch is malfunctioning.	Remove the temperature switch. Refer to Coolant Temperature Switch Removal/Installation in Section 7. Test the temperature switch. Repair or replace the switch, if necessary.
OK	
Refer to a Cummins Authorized Repair Facility.	

Coolant Temperature Below Normal (Engine Off)

Cause	Correction
The 120 VAC power supply to the coolant heater is not connected.	Connect the power supply. Correct any electrical faults in the supply circuit.
	
The heater's overload thermostat has operated.	Ensure that there is coolant in the heater. Allow time for the automatic overload reset to occur.
	
Coolant temperature sender is malfunctioning.	Replace the temperature sender. Refer to Coolant Temperature Sender Removal/Installation in Section 7.
	
Coolant temperature gauge is malfunctioning.	Replace the temperature gauge. Refer to Coolant Temperature Gauge Removal/Installation in Section 7.
	
Coolant is not free to circulate through the heater.	Ensure that the coolant hoses are clear. Refer to Coolant Hose Removal/Installation in Section 7.
	
The coolant heater has failed electrically.	Replace the coolant heater. Refer to Coolant Heater Removal/Installation in Section 7.
	
Contact a Cummins Authorized Repair Facility.	

Coolant Temperature Below Normal (Engine Running)

Cause	Correction
Coolant thermostat has failed open.	Test operation of the thermostat. Refer to Coolant Thermostat Tests in Section 7. If necessary, replace the thermostat. Refer to Coolant Thermostat Removal/Installation in Section 7.
OK	
Coolant temperature sender is malfunctioning.	Replace the temperature sender. Refer to Coolant Temperature Sender Removal/Installation in Section 7.
OK	
Coolant temperature gauge is malfunctioning.	Replace the temperature gauge. Refer to Coolant Temperature Gauge Removal/Installation in Section 7.
OK	
Contact an Authorized Cummins Repair Facility.	

Raw Water Drain Steaming

NOTE: The raw water drain from the Coolant Heat Exchanger may steam if raw water flow is inadequate when the engine is running. It may also steam shortly after the engine is stopped. If coolant is leaking into the raw water drain piping, the steaming may last for some time while the engine cools. Antifreeze may also be observed in the raw water drain.

Cause	Correction
Raw water flow did not start when the engine started.	Check engine coolant temperature. Go to Coolant Temperature Above Normal in this section.
	
Engine coolant is leaking into the raw water piping in the coolant heat exchanger.	When practical, remove the coolant heat exchanger and perform the pressure test. Refer to Coolant Heat Exchanger Removal/Installation in Section 7. If pressure is not maintained, replace the heat exchanger.
	
Contact an Authorized Cummins Repair Facility.	

Raw Water Solenoid Valve Fails to Operate

NOTE: The raw water solenoid failure may fail to open or to close. The normally closed valve may fail to open when the engine starts. This fault will prevent raw water flow through the normal valves. Bypass flow should be aligned in this event. The valve may also fail to close because of mechanical blockage. In this event, the raw water flow from the heat exchanger does not stop when it should. Depending upon the fire protection system piping, the open solenoid valve may drain all water from the fire protection system piping that is higher than the engine's piping.

Cause	Correction
Solenoid valve fails to close when the engine stops.	Replace the solenoid valve. Refer to Raw Water Solenoid Valve Removal/Installation in Section 7. Clean the raw water strainer more frequently. Increase the frequency of operational testing.
	
Solenoid valve fails to energize.	Check electrical continuity and insulation from ground to the solenoid. Repair any open or short circuits in the wiring.
	
Solenoid fails to open mechanically.	**NOTE**: Apply the correct operating voltage, either 12 VDC or 24 VDC depending upon the model. Apply temporary voltage to the solenoid. If the solenoid fails to operate, replace it. Refer to Raw Water Solenoid Valve Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Auto Start Failure - Does not Crank on A

NOTE: The fire pump engine will not crank automatically when solenoid A is selected at the fire protection system. However, it does start automatically when solenoid B is selected.

Cause	Correction
The electrical connection from the fire protection system to Terminal Board TB 9 has failed.	Test continuity and insulation from ground between the fire protection system and the engine control panel. Locate and repair any electrical fault in the field wiring or in the fire protection system panel.
	
The electrical connection from Terminal Board TB 9 to Relay K1 has failed.	Test continuity and insulation from ground between the TB 9 and Relay K1. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Relay K1 has failed.	Check de-energized continuity at Relay K1 pin 87 to 30. Replace K1 if the circuit is open.
	
Contact an Authorized Cummins Repair Facility.	

Auto Start Failure - Does not Crank on B

NOTE: The fire pump engine will not crank automatically when solenoid B is selected at the fire protection system. However, it does start automatically when solenoid A is selected.

Cause	Correction
The electrical connection from the fire protection system to Terminal Board TB 10 has failed.	Test continuity and insulation from ground between the fire protection system and the engine control panel. Locate and repair any electrical fault in the field wiring or in the fire protection system panel.
	
The electrical connection from Terminal Board TB 10 to Relay K2 has failed.	Test continuity and insulation from ground between the TB 10 and Relay K2. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Relay K2 has failed.	Check de-energized continuity at Relay K2 pin 87 to 30. Replace K1 if the circuit is open.
	
Contact an Authorized Cummins Repair Facility.	

Auto Start Failure - Does not Crank on A or B

NOTE: The fire pump engine will not crank automatically when either solenoid A or solenoid B is selected at the fire protection system. However, it does crank and start when started locally. If local starting problems are identified, go to the applicable Manual Start Failure troubleshooting table.

Cause	Correction
The Fire Protection System fails to produce either redundant start signal to the fire pump.	Locate and correct the common mode fault in the Fire Protection System.

Auto Start Failure – Cranks but does not Start

NOTE: The fire pump engine will crank automatically when either solenoid A or solenoid B is selected at the fire protection system. However, the engine does not start. The engine will start locally. If local starting problems are identified, go to the applicable Manual Start Failure troubleshooting table.

Cause	Correction
The overspeed switch as actuated. The overspeed lamp is illuminated on the local control panel.	Press the RESET switch on the local control panel.
OK	
Control power from the Fire Protection System is not available at local control panel TB1.	When practical, locate and correct the fault in the Fire Protection System or the field wiring to the local control panel.
OK	
Circuit Breaker CB is open in the local control panel.	Check whether Circuit Breaker CB at the local control panel is open. Refer to Drawing 10423 Sheet 1 in Section 13. If open, reset the circuit breaker. Locate and correct any electrical faults in the control panel. Press the RESET switch on the local control panel.
OK	
The AUTO/MANUAL Rocker Switch fails to select AUTO mode.	When practical, open Circuit Breaker CB at the local control panel and test switch operation electrically. Refer to Drawing 10423 Sheet 1 in Section 13. If required, replace the switch or repair other electrical faults. When done, close Circuit Breaker CB at the local control panel and reset rocker switch to AUTO mode.
OK	

Auto Start Failure – Cranks but does not Start (Cont)

The overspeed switch has failed.	Check power and grounding to the overspeed switch. Refer to Drawing 10423 Sheet 1 in Section 13. Repair any electrical faults. If required, test and adjust the overspeed setting. Refer to Overspeed Setpoint Adjustment and Testing in Section 3. Replace the overspeed switch. Refer to Overspeed Switch Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Auto Start Failure – Engine Starts but Crank Terminate does not Occur

Cause	Correction
The overspeed switch not correctly adjusted or has failed.	When practical, with the engine running, verify speed sensor input to the overspeed switch. Refer to Drawing 10423 Sheet 1 in Section 13. If signal is not present, go to The speed sensor has failed. The tachometer also indicates zero speed in this table. Adjust the overspeed switch crank terminate setpoint. Refer to Section 3. If required, replace the overspeed switch. Refer to Overspeed Switch Removal/Installation in Section 7.
	
Fuse 3 has opened. The raw water solenoid valve also fails to open.	Open the raw water bypass valves. When practical, replace Fuse F3. Locate and repair any local electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
The speed sensor has failed. The tachometer also indicates zero speed.	When practical, locate and repair any electrical fault in the speed sensor circuitry. Refer to Drawing 10423 Sheet 1 in Section 13. If necessary, replace the speed sensor. Refer to Speed Sensor Removal/Installation in Section 7.
	
An electrical fault is present in the Fire Protection System.	When practical, test continuity and insulation from ground in the fire protection system and the engine control panel. Locate and repair any electrical fault in the fire protection system panel.
	
An electrical fault is present between Control Panel TB 2 and the Fire Protection System.	When practical, test continuity and insulation from ground between the fire protection system and the engine control panel. Locate and repair any electrical fault in the field wiring.
	

Auto Start Failure – Engine Starts but Crank Terminate does not Occur (Cont)

An electrical fault is present in the control panel between Fuse F3 and TB 2.	When practical, test continuity and insulation from ground between Fuse F3 and TB 2. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Contact an Authorized Cummins Repair Facility.	

Manual Start Failure from Solenoid Lever - Does not Crank on A

NOTE: The fire pump engine will not crank locally from the solenoid lever when solenoid A is actuated. However, it does start when solenoid B is actuated.

Cause	Correction
Battery A is discharged or has failed.	Recharge or replace the battery.
	
An electrical fault is present between Battery A and the starter motor.	When practical, test continuity and insulation from ground between Battery A and the starter motor. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Solenoid A's switch contact does not close.	Remove and test Solenoid A lever and switch operation. Refer to Crank Solenoid Assembly Removal/Installation in Section 7. If required, replace Solenoid A.
	
Contact an Authorized Cummins Repair Facility.	

Manual Start Failure from Solenoid Lever - Does not Crank on B

NOTE: The fire pump engine will not crank locally from the solenoid lever when solenoid B is actuated. However, it does start when solenoid A is actuated.

Cause	Correction
Battery B is discharged or has failed.	Recharge or replace the battery.
	
An electrical fault is present between Battery B and the starter motor.	When practical, test continuity and insulation from ground between Battery B and the starter motor. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Solenoid B's switch contact does not close.	Remove and test Solenoid B lever and switch operation. Refer to Crank Solenoid Assembly Removal/Installation in Section 7. If required, replace Solenoid B.
	
Contact an Authorized Cummins Repair Facility.	

Manual Start Failure from Solenoid Lever - Does not Crank on A or B

NOTE: The fire pump engine will not crank locally when either solenoid lever is actuated.

Cause	Correction
Starter motor has failed.	Replace the starter motor. Refer to Starter Motor Removal/Installation in Section 7.
	
An electrical fault is present in the power or ground circuit for the starter motor.	Test continuity and insulation from ground between the battery splice, the ground connection, and the starter motor. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Engine is seized.	Bar the engine over to break the seizure.
	
Contact an Authorized Cummins Repair Facility.	

Manual Start Failure from Control Panel - Does not Crank on A

NOTE: The fire pump engine will not crank locally from the control panel when CRANK BATT A is selected. However, it does start when CRANK BATT B is selected.

Cause	Correction
The CRANK BATT A switch fails to make contact.	When practical, test the electrical operation of the CRANK BATT A switch. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the switch if faulted.
	
Relay K1 fails in the local manual mode.	When practical, test the electrical operation of the Relay K1. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the relay if faulted.
	
Solenoid A fails to energize due to electrical fault in the power or ground circuit.	Test continuity and insulation from ground between the CRANK BATT A switch, Relay K1, and the starter Solenoid. Also, check the solenoid coil connection to ground. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Solenoid A fails to operate.	When practical, test the electrical operation of the Solenoid A. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the solenoid if faulted.
	
Contact an Authorized Cummins Repair Facility.	

Manual Start Failure from Control Panel - Does not Crank on B

NOTE: The fire pump engine will not crank locally from the control panel when CRANK BATT B is selected. However, it does start when CRANK BATT A is selected.

Cause	Correction
The CRANK BATT B switch fails to make contact.	When practical, test the electrical operation of the CRANK BATT B switch. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the switch if faulted.
OK	
Relay K2 fails in the local manual mode.	When practical, test the electrical operation of the Relay K2. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the relay if faulted.
OK	
Solenoid B fails to energize due to electrical fault in the power or ground circuit.	Test continuity and insulation from ground between the CRANK BATT B switch, Relay K2, and the starter Solenoid. Also, check the solenoid coil connection to ground. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
OK	
Solenoid B fails to operate.	When practical, test the electrical operation of the Solenoid B. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the solenoid if faulted.
OK	
Contact an Authorized Cummins Repair Facility.	

Manual Start Failure from Control Panel - Does not Crank on A or B

NOTE: The fire pump engine will not crank locally from the control panel when either CRANK BATT A or CRANK BATT B is selected. However, it does start when a solenoid lever is actuated.

Cause	Correction
The MANUAL mode rocker switch contact fails to close.	When practical, test the electrical operation of the AUTO/MANUAL rocker switch. Refer to Drawing 10423 Sheet 1 in Section 13. Replace the solenoid if faulted.
	
An electrical fault exists in the signal power circuit or the ground to the Relays K1 and K2.	Test continuity and insulation from ground between the AUTO/MANUAL rocker switch and the relays. Also, check the relay connection to ground. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Fuse F3 has opened. The raw water solenoid valve also fails to open.	Open the raw water bypass valves. When practical, replace Fuse F3. Locate and repair any local electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
An electrical fault exists in the signal power circuit or the ground to the overspeed switch's crank circuit.	Test continuity and insulation from ground between Fuse F3 and the overspeed switch's crank circuit. Also, check the crank circuit output to the CRANK BATT switches. Locate and repair any electrical fault. Refer to Drawing 10423 Sheet 1 in Section 13.
	
Overspeed switch crank circuit fails to reset with engine shutdown.	If required, test and adjust the crank setting. Refer to Overspeed Setpoint Adjustment and Testing in Section 3. If required, replace the overspeed switch. Refer to Overspeed Switch Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Engine Cranks Normally But Will Not Start (No Exhaust Smoke)

Cause	Correction
No fuel in supply tank.	Check and replenish fuel supply. Check fittings and hose connections and hose conditions.
	
Air is in the fuel system.	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe and fuel filters as necessary. Vent air from the system. Refer to Air in Fuel in Section 7.
	
Manual fuel shutoff lever is binding.	Check to be sure manual shutoff lever is not binding at the injection pump.
	
Fuel drain line is restricted.	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary.
	
Fuel filter is clogged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 5.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine from a tank of high-quality fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	
Fuel injection pump is malfunctioning.	Perform the fuel injection pump test.
	

Engine Cranks Normally But Will Not Start (No Exhaust Smoke) (Cont)

Cause	Correction
Fuel injection pump timing is not correct.	Check and adjust the fuel pump timing. Refer to Fuel Adjust Fuel Pump in Section 7.
	
Fuel tank is empty.	Fill the fuel supply tank.
	
Fuel pre-filter is clogged.	Clean the customer-supplied fuel pre-filter.
	
Fuel pump overflow valve is malfunctioning.	Check the overflow valve. Replace if necessary.
	
Fuel Shutoff Valve (FSOV) fails to open.	If the fuel shutoff valve is not functioning, manually override it. Refer to Emergency Starting With Failed Fuel Shut-Off Solenoid in Section 3. When practical, check the wiring for electrical faults. Refer to Drawing 10423 Sheet 2 in Section 13. If the wiring is OK, replace the Fuel Shutoff Valve. Refer to Fuel Shutoff Valve (FSOV) Removal/ Installation in Section 7.
	
Fuel suction line is restricted.	Check the fuel suction line for restriction.
	
Fuel connections on the suction side of the fuel lift pump are loose.	Tighten all the fuel fittings and connections between the fuel tanks and fuel lift pump.
	

Engine Cranks Normally But Will Not Start (No Exhaust Smoke) (Cont)

Cause	Correction
Fuel suction standpipe in the fuel tank is broken.	Check and repair the standpipe, if necessary.
	
Fuel supply is not adequate.	Check the flow through the filter to locate the source of the restriction.
	
Fuel tank air breather hole is clogged.	Clean the fuel tank breather.
	
Fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	
Injection pump driveshaft or driveshaft key is damaged.	Repair or replace the injection pump. Refer to Fuel Injection Pump Removal/Installation in Section 7.
	
Fuel injectors are plugged.	Replace the fuel injectors. Refer to Fuel Injectors Removal/Installation in Section 7.
	
Throttle linkage misadjusted or damaged.	Adjust or repair the linkage. Refer to instructions in Section 7.
	
Starting motor rotation is not correct.	Check the direction of crankshaft rotation. Refer to instructions in Section 7. Replace the starting motor if necessary. Refer to Starter Motor Assembly Removal/Installation in Section 7.
	

Engine Cranks Normally But Will Not Start (No Exhaust Smoke) (Cont)

Cause	Correction
Starting motor is not turning the engine.	Replace the starting motor if necessary. Refer to Starter Motor Assembly Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Engine Cranks Slowly But Does Not Start

NOTE: Typical engine cranking speed is 120 RPM. Engine cranking speed can be checked with a hand-held tachometer, stroboscope, or electronic service tool.

Cause	Correction
The batteries are cold.	Ensure that the batteries are protected from extreme temperatures.
	
The battery cables or connections are loose, broken, or corroded creating excessive resistance.	Check the battery cables and connections. Ensure that connections are clean and tight.
	
The battery is not properly charged or has failed.	Recharge the battery. If the battery does not take the charge, replace it.
	
Lubricating oil level is too high.	Check the oil level. Refer to Check Engine Oil Level in Section 5. Drain any excess oil.
	
Lubricating oil is the wrong grade or type.	Check the grade and type of oil. Refer to Lubricating Oil Recommendations and Specifications in Section 10. If the wrong type or grade of oil is present, drain and replace it. Refer to Change Lubricating Oil and Filters in Section 7.
	
Engine temperature is too low.	Troubleshoot as per Coolant Temperature Below Normal (Engine Off) in this section.
	

Engine Cranks Slowly But Does Not Start (Cont)

Cause	Correction
Starting motor is malfunctioning.	Replace the starting motor. Refer to Starter Motor Assembly Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Engine Difficult to Start or Will Not Start - Exhaust Smoke Present

NOTE: If the engine cranks slowly, refer to Engine Cranks Slowly But Does Not Start in this section.

Cause	Correction
Fuel tank level is low.	Fill the fuel tank. Fill and bleed the fuel lines to the engine.
	
Fuel drain line is restricted.	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary.
	
Fuel filter is clogged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 7.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine from a tank of high-quality fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	
Fuel injection pump is malfunctioning.	Perform the fuel injection pump test.
	
Fuel injection pump timing is not correct.	Check and adjust the fuel pump timing. Refer to Fuel Adjust Fuel Pump in Section 7.
	
Fuel pre-filter is clogged.	Clean the customer-supplied fuel pre-filter.
	
Fuel pump overflow valve is malfunctioning.	Check the overflow valve. Replace if necessary.
	

Engine Difficult to Start or Will Not Start - Exhaust Smoke Present (Cont)

Cause	Correction
Fuel suction line is restricted.	Check the fuel suction line for restriction.
	
Fuel connections on the suction side of the fuel lift pump are loose.	Tighten all the fuel fittings and connections between the fuel tanks and fuel lift pump.
	
Fuel suction standpipe in the fuel tank is broken.	Check and repair the standpipe, if necessary.
	
Fuel tank air breather hole is clogged.	Clean the fuel tank breather.
	
Fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	
Fuel injectors are plugged.	Replace the fuel injectors. Refer to Fuel Injectors Removal/Installation in Section 7.
	
Throttle linkage misadjusted or damaged.	Adjust or repair the linkage. Refer to instructions in Section 7.
	
Intake air flow is restricted.	Check the air intake system for restriction. Refer to Check Air Cleaner Service Indicator in Section 5. Replace the air filter if required.
	

Engine Difficult to Start or Will Not Start - Exhaust Smoke Present (Cont)

Cause	Correction
Exhaust air flow is restricted.	Check the exhaust air piping for restriction. Remove any restriction.
	
Contact a Cummins Authorized Repair Facility.	

Engine Acceleration or Response Poor

Cause	Correction
Fuel drain line is restricted.	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary.
	
Fuel filter is clogged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 7.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine from a tank of high-quality fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	
Fuel injection pump is malfunctioning.	Perform the fuel injection pump test.
	
Fuel injection pump timing is not correct.	Check and adjust the fuel pump timing. Refer to Fuel Adjust Fuel Pump in Section 7.
	
Fuel pre-filter is clogged.	Clean the customer-supplied fuel pre-filter.
	
Fuel pump overflow valve is malfunctioning.	Check the overflow valve. Replace if necessary.
	
Fuel suction line is restricted.	Check the fuel suction line for restriction.
	

Engine Acceleration or Response Poor (Cont)

Cause	Correction
Fuel connections on the suction side of the fuel lift pump are loose.	Tighten all the fuel fittings and connections between the fuel tanks and fuel lift pump.
OK	
Fuel suction standpipe in the fuel tank is broken.	Check and repair the standpipe, if necessary.
OK	
Fuel tank air breather hole is clogged.	Clean the fuel tank breather.
OK	
Fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
OK	
Fuel injectors are plugged.	Replace the fuel injectors. Refer to Fuel Injectors Removal/Installation in Section 7.
OK	
Throttle linkage misadjusted or damaged.	Adjust or repair the linkage. Refer to instructions in Section 7.
OK	
Intake air flow is restricted.	Check the air intake system for restriction. Refer to Check Air Cleaner Service Indicator in Section 7. Replace the air filter if required.
OK	
Exhaust air flow is restricted.	Check the exhaust air piping for restriction. Remove any restriction.
OK	

Engine Acceleration or Response Poor (Cont)

Cause	Correction
Exhaust air is leaking.	Check the exhaust piping for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. If required, replace the turbocharger. Refer to Turbocharger Removal/Installation in Section 7.
	
Refer to a Cummins Authorized Repair Facility.	

Engine Noise Excessive - Mechanical

Cause	Correction
Lubricating oil is thin or diluted.	Check the oil level. Refer to Check Lubricating Oil Level in Section 7. If the oil level is above the high mark, go to Oil Level Rises in this section.
OK	
Lubricating oil pressure is below specification.	**NOTE**: Oil pressure should range between 69 and 345 kPa [10 to 50 PSI] with the engine running. Check the oil pressure on the local control panel. If the pressure is low, refer to the Lubricating Oil Pressure Low symptom tree in this section.
OK	
Vibration damper is damaged.	Inspect the vibration damper. Refer to Inspect Vibration Damper in Section 5. If the vibration damper is damaged, refer to a Cummins Authorized Repair Facility.
OK	
Engine mounts are worn or damaged.	Inspect the engine mounts. If the engine mounts are worn or damaged, refer to a Cummins Authorized Repair Facility.
OK	
Coolant temperature is above specification.	Check the coolant temperature indication on the local control panel. If the high coolant temperature light is illuminated, refer to the Coolant Temperature Above Normal symptom tree in this section.
OK	

Engine Noise Excessive – Mechanical (Cont)

Cause	Correction
Drive belt is squeaking due to insufficient tension or high loading.	Check and adjust belt tension. Refer to Adjust Alternator Drive Belt Tension in Section 7.
	
Intake air flow is restricted.	Check the air intake system for restriction. Refer to Check Air Cleaner Service Indicator in Section 5. Replace the air filter if required.
	
Exhaust air flow is restricted.	Check the exhaust air piping for restriction. Remove any restriction.
	
Air leakage between the turbocharger and head.	Tighten the clamp between turbocharger and head. Repair leaks between turbocharger and head.
	
Turbocharger does not rotate freely.	Replace the turbocharger. Refer to Turbocharger Removal/Installation in Section 7.
	
Contact a Cummins Authorized Repair Facility.	

Engine Noise Excessive — Combustion Knocks

Cause	Correction
Engine is overloaded.	Check for added mechanical loading from damaged or defective pump, changes in suction head, or changes in discharge piping restriction.
OK	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine using the correct fuel. Refer to Fuel Recommendations and Specifications in Section 10.
OK	
Air in present in the fuel supply to the engine.	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe and fuel filters as necessary. Vent air from the system. Refer to Air in Fuel in Section 7.
OK	
The fuel injection pump's timing is not correct.	Check and adjust the fuel injection pump timing. Refer to Adjust Fuel Pump in Section 7.
OK	
The fuel injection pump is failing.	Replace the fuel injection pump. Refer to Fuel Injection Pump Removal/Installation in Section 7.
OK	
Coolant temperature is below specification.	Refer to the Coolant Temperature Below Normal (Engine Running) symptom tree in this section.
OK	
Contact a Cummins Authorized Repair Facility.	

Engine Runs Rough at Idle

NOTE: Operation at idle speed is for maintenance only.

Cause	Correction
Engine is cold.	Allow the engine to warm to operating temperature. If the engine will not reach operating temperature, refer to the Coolant Temperature Below Normal (Engine Running) symptom tree.
	
Idle speed is set too low.	Adjust the idle speed. Refer to instructions in Section 7.
	
Air is present in the fuel system.	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe and fuel filters as necessary. Vent air from the system. Refer to Air in Fuel in Section 7.
	
Fuel filter is becoming plugged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 5.
	
Fuel supply to the engine is inadequate.	Locate and correct the restriction in fuel flow to the engine.
	
The fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	
Engine mounts are worn or damaged.	Check the engine mounts. If damaged, refer to a Cummins Authorized Repair Facility.
	

Engine Runs Rough at Idle (Cont)

Cause	Correction
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine on the required fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	
Fuel pump overflow valve is malfunctioning.	Check the overflow valve. Replace if necessary.
	
Fuel injection pump timing is incorrect.	Check and adjust the injection pump timing. Refer to Adjust Fuel Pump in Section 7.
	
Injector is malfunctioning.	Inspect the injectors. Replace the injectors as necessary. Refer to Fuel Injectors Removal/Installation in Section 7.
	
Fuel injection pump is malfunctioning.	Remove the fuel injection pump. Refer to Fuel Injection Pump Removal/Installation in Section 7. Check the calibration of the fuel injection pump. Refer to instructions in Section 7. Replace the pump if necessary.
	
Contact a Cummins Authorized Repair Facility.	

Engine Runs Rough or Misfires Under Load

Cause	Correction
Engine is cold.	Allow the engine to warm to operating temperature. If the engine will not reach operating temperature, refer to the Coolant Temperature Below Normal (Engine Running) symptom tree.
	
Air is present in the fuel system.	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe and fuel filters as necessary. Vent air from the system. Refer to Air in Fuel in Section 7.
	
Fuel filter is becoming plugged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 7.
	
Fuel supply to the engine is inadequate.	Locate and correct the restriction in fuel flow to the engine.
	
The fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	
Engine mounts are worn or damaged.	Check the engine mounts. If damaged, refer to a Cummins Authorized Repair Facility.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine on the required fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	

Engine Runs Rough or Misfires Under Load (Cont)

Cause	Correction
Fuel pump overflow valve is malfunctioning.	Check the overflow valve. Replace if necessary. Refer to instruction in Section 7.
	
Fuel injection pump timing is incorrect.	Check and adjust the injection pump timing. Refer to Adjust Fuel Pump in Section 7.
	
Injector is malfunctioning.	Inspect the injectors. Replace the injectors as necessary. Refer to Fuel Injectors Removal/Installation in Section 7.
	
Fuel injection pump is malfunctioning.	Remove the fuel injection pump. Refer to Fuel Injection Pump Removal/Installation in Section 7. Check the calibration of the fuel injection pump. Refer to instructions in Section 7. Replace the pump if necessary.
	
Contact a Cummins Authorized Repair Facility.	

Engine Speed Surges at Idle

NOTE: Operation at idle speed is for maintenance only.

Cause	Correction
Fuel level is low in the tank.	Fill the fuel tank. Fill and bleed the fuel lines to the engine.
	
Engine idle speed is set too low.	Adjust the idle speed. Refer to instructions in Section 7.
	
Air is in the fuel supply to the engine.	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe and fuel filters as necessary. Vent air from the system. Refer to Air in Fuel in Section 7.
	
The fuel filter is plugged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 5.
	
Fuel flow to the engine is not adequate.	Locate and correct the restriction in the customer-supplied fuel lines to the engine.
	
The fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine with the required fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	

Engine Speed Surges at Idle (Cont)

Cause	Correction
The fuel injection pump is malfunctioning.	Remove the fuel pump. Refer to Fuel Injection Pump Removal/Installation in Section 7. Calibrate the fuel pump. Refer to instructions in Section 7. If required, replace the fuel injection pump.
OK	
A fuel supply line restriction exists between the fuel injection pump and the injectors.	Check the fuel supply line or passage for sharp bends or restriction. Remove any restrictions.
OK	
A fuel injector is malfunctioning.	Replace the malfunctioning injector. Refer to Fuel Injectors Removal/Installation in Section 7.
OK	
Moisture is present in the wiring harness connectors.	Dry the connectors with Cummins electronic cleaner, Part Number 3824510.
OK	
Contact a Cummins Authorized Repair Facility.	

Engine Speed Surges Under Load

Cause	Correction
Pump suction head or pump discharge head changes.	Some variation in speed response to load changes is normal. Excessive speed changes may occur upon sudden failures in either suction or discharge piping systems.
OK	
Fuel level is low in the tank.	Fill the fuel tank. Fill and bleed the fuel lines to the engine.
OK	
Air is in the fuel supply to the engine.	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe and fuel filters as necessary. Vent air from the system. Refer to Air in Fuel in Section 7.
OK	
The fuel filter is plugged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 5.
OK	
Fuel flow to the engine is not adequate.	Locate and correct the restriction in the customer-supplied fuel lines to the engine.
OK	
The fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
OK	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine with the required fuel. Refer to Fuel Recommendations and Specifications in Section 10.
OK	

Engine Speed Surges Under Load (Cont)

Cause	Correction
The fuel injection pump is malfunctioning.	Remove the fuel pump. Refer to Fuel Injection Pump Removal/Installation in Section 7. Calibrate the fuel pump. Refer to instructions in Section 7. If required, replace the fuel injection pump.
	
A fuel supply line restriction exists between the fuel injection pump and the injectors.	Check the fuel supply line or passage for sharp bends or restriction. Remove any restrictions.
	
A fuel injector is malfunctioning.	Replace the malfunctioning injector. Refer to Fuel Injectors Removal/Installation in Section 7.
	
Moisture is present in the wiring harness connectors.	Dry the connectors with Cummins electronic cleaner, Part Number 3824510.
	
Contact a Cummins Authorized Repair Facility.	

Engine Vibration Excessive at Rated Speed

Cause	Correction
Engine runs rough or is misfiring.	Refer to the Engine Runs Rough or Misfires Under Load symptom tree in this section.
OK	
Fuel injection pump is adjusted incorrectly.	Adjust or replace the injection pump. Refer to Adjust Fuel Pump and/or Fuel Injection Pump Removal/ Installation in Section 7.
OK	
Engine mounts are worn or damaged.	Inspect the engine mounts. Refer to Check Engine Mounting Bolts in Section 5. Replace the engine mounts as needed. Refer to a Cummins Authorized Repair Facility.
OK	
Vibration damper is malfunctioning.	Inspect the vibration damper. Refer to Inspect Vibration Damper in Section 5. Replace, if necessary. Refer to a Cummins Authorized Repair Facility.
OK	
Alternator bearing is worn or damaged.	Check if the alternator is vibrating excessively. Replace the alternator if necessary. Refer to Alternator Removal/Installation in Section 7.
OK	
Water pump bearing is worn or damaged.	Check if the water pump is vibrating excessively. Replace the pump if necessary. Refer to Water Pump Removal/Installation in Section 7.
OK	
Contact a Cummins Authorized Repair Facility.	

Engine Stops During Operation

Cause	Correction
Normal automatic mode shutdown occurs when the fire protection systems removes the signal power feed to the local control panel.	No action is required. This is a desirable outcome.
OK	
In the automatic mode, the signal power feed is lost from the fire protection system to the control panel.	Locate and correct the electrical fault in the fire protection system or the field wiring to the engine control panel.
OK	
Signal power is lost by the operation of the circuit breaker the engine control panel.	Press the circuit breaker reset button on the engine control panel. Locate and correct the electrical fault in engine control panel. Refer to Drawing 10423 Sheet 1 in Section 13.
OK	
An overspeed trip has occurred. The overspeed trip light is illuminated on the local control panel. Remote indications may also be present. Alternatively, a related overspeed switch failure has occurred. The trip indications may not be present.	Go to Engine Overspeed Trip in this section.
OK	
The fuel shutoff valve (FSOV) has failed.	Check the wiring continuity and insulation from ground for the Fuel Shutoff Switch. Refer to Drawing 10423 Sheet 1 and Drawing 10423 Sheet 2 in Section 13. Correct any electrical faults. If required, replace the FSOV. Refer to Fuel Shutoff Valve (FSOV) Removal/Installation in Section 7.
OK	
Fuel tank level is low.	Fill the fuel tank. Fill and bleed the fuel lines to the engine.
OK	

Engine Stops During Operation (Cont)

Cause	Correction
Clogged fuel tank air breather hole.	Clean the fuel tank breather.
	
Customer-supplied fuel pre-filter is clogged.	Clean the fuel pre-filter. Fill and bleed the fuel lines to the engine.
	
Fuel piping to engine is clogged.	Clean and repair the fuel piping to the engine.
	
The fuel filter is clogged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 5.
	
Air is trapped in the low pressure fuel lines at the engine.	Bleed the fuel lines. Refer to Air in Fuel in Section 7.
	
Fuel lift pump has failed.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	
Fuel injection pump has failed.	Replace the fuel injection pump. Refer to Fuel Injection Pump Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Engine Will Not Reach Rated Speed (RPM)

Cause	Correction
Load is excessive for engine horsepower rating.	Reduce the engine load.
OK	
Throttle adjustment is not correct.	Check the throttle adjustment. Refer to Section 3.
OK	
Fuel shutoff lever (mechanical) partially engaged.	Make sure fuel shutoff lever is in the RUN position. Refer to Section 3. Replace if necessary. Refer to instructions in Section 7.
OK	
Tachometer is not calibrated.	Compare the tachometer reading with a handheld tachometer or an electronic service tool reading. If out of calibration, calibrate the tachometer as necessary at the CAL adjustment on the back of the gauge. Refer to Tachometer Calibration in Section 7.
Tachometer is malfunctioning.	Replace the tachometer. Refer to Tachometer Removal/Installation in Section 7.
OK	
Engine power output is low.	Refer to the Engine Acceleration or Response Poor symptom tree in this section.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor.	Operate the engine with the required fuel. Refer to Fuel Recommendations and Specifications in Section 10.
OK	
Fuel filter is clogged.	Replace the fuel filter. Refer to Change Fuel Filter in Section 5.
OK	

Engine Will Not Reach Rated Speed (RPM) (Cont)

Cause	Correction
Fuel suction line is restricted.	Check the fuel suction line for restriction.
	
Air-fuel tube leaking, wastegate diaphragm ruptured, or wastegate plumbing damaged.	Tighten the fittings, repair plumbing, replace wastegate diaphragm.
	
Charge air cooler restricted (if equipped).	Inspect the air cooler for internal and external restrictions. Replace the restricted cooler if necessary.
	
Fuel supply is not adequate.	Locate and correct the restriction in the customer-supplied fuel lines to the engine.
	
Exhaust back pressure too high.	**NOTE**: The maximum allowable exhaust back pressure is specified in Exhaust System Specifications in Section 10. Measure the exhaust back pressure. Correct the problem is it is above specification.
	
Fuel lift pump is malfunctioning.	Check the fuel lift pump for correct operation. Check the pump output pressure. Replace the fuel lift pump if necessary. Refer to Fuel Lift Pump Removal/ Installation in Section 7.
	

Engine Will Not Reach Rated Speed (RPM) (Cont)

Fuel injection pump is malfunctioning.	Remove the fuel pump. Refer to Fuel Injection Pump Removal/Installation in Section 7. Calibrate the fuel pump. If required, replace the fuel injection pump.
OK	
Contact an Authorized Cummins Repair Facility.	

Engine Will Not Shut Off Remotely

Cause	Correction
Stop circuit malfunction in the fire pump controller of field wiring.	**NOTE**: In the AUTO mode, the fire pump engine stops upon loss of signal power from the fire pump controller. Check the engine stop circuit in the fire pump controller. Correct any faults. Check for short to voltage on the signal wiring from the fire pump controller to the engine control panel. Correct any faults. Check operation of the switch contacts of the AUTO/MANUAL switch at the engine control panel. Replace the switch if the switch contacts fail to operate properly.
OK	
Fuel Shutoff Valve (FSOV) fails to close.	Press the RESET switch on the engine control panel. Alternatively, operate the manual override. **NOTE**: If the RESET switch did not close the valve, an electrical fault to voltage may be present. Refer to Drawing 10423 Sheet 1 and Drawing 10423 Sheet 2 in Section 13. If required, replace the fuel shutoff valve. Refer to Fuel Shutoff Valve (FSOV) Removal/Installation in Section 7.
OK	
Engine running on fumes drawn into the air intake.	Identify and isolate the source of the combustible fumes.
OK	
Contact an Authorized Cummins Repair Facility.	

Engine Will Not Shut Off Locally

Cause	Correction
Fuel Shutoff Valve (FSOV) fails to close.	Press the RESET switch on the engine control panel. Alternatively, operate the manual override. **NOTE**: If the RESET switch did not close the valve, an electrical fault to voltage may be present. Refer to Drawing 10423 Sheet 1 and Drawing 10423 Sheet 2 in Section 13. If required, replace the fuel shutoff valve. Refer to Fuel Shutoff Valve (FSOV) Removal/Installation in Section 7.
	
Engine is running on fumes drawn into the air intake.	Identify and isolate the source of the combustible fumes.
	
Refer to a Cummins Authorized Repair Facility.	

Excessive White Exhaust Smoke

Cause	Correction
Engine is operating at low ambient temperature.	Refer to Cold Weather Operation, Bulletin Number 3387266, and the Operation and Maintenance manual, Bulletin Number 3666417 for cold weather operating aids and guidelines.
	
Air in the fuel system.	Check for air in the fuel system by installing a clear hose on the suction side of the fuel pump. Verify fuel drain is below the fuel level in the tank as air will enter the suction and drain lines if fuel drain is not below fuel level. Injectors can also be a source of combustion gases leaking back into the fuel system.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine from a tank of good fuel (40 Cetane min. above 32°F, 45 Cetane min. below 32°F). Refer to Fuel recommendations and Specifications in the Operation and Maintenance manual, Bulletin Number 3666417.
	
Fuel filter is plugged.	Measure the fuel inlet restriction to the filter head (3 in. Hg max.). Measure the fuel pressure drop across the fuel filter (1.5 in. Hg. max). Max. restriction to fuel pump is 4.5 in. Hg.
	
Air intake system restriction is above specification.	Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary.
	
Air intake or exhaust leaks.	Visually inspect the air intake and exhaust systems for air leaks by looking for cracks, listening for high pitch whining or sucking noises, or use a soapy solution in the suspect areas.
	

Excessive White Exhaust Smoke (Cont)

Cause	Correction
Fuel drain line restriction is above specification.	Check the fuel drain lines for restriction (7.5 in. Hg max). Clear or replace the fuel lines or tank vents as necessary.
	
Fuel pump static injection timing is not correct.	Verify the static injection timing with the value listed on the engine data tag. Refer to the Troubleshooting and Repair manual, Bulletin Number 3666418 for procedure. Turbocharged engines = 8°BTDC +/- 1°
	
Overhead adjustments are not correct.	Adjust the overhead settings. Refer to the Troubleshooting and Repair manual, Bulletin Number 3666418.
	
Injectors are not correct.	Remove the injectors and compare the identification number on the injector with the injector cross-reference table 1.
	
Injector is malfunctioning.	Test the injector opening pressures (min 167 bar for used injectors). Replace injectors as necessary. Refer to the Troubleshooting and Repair manual, Bulletin Number 3666418.
	
Fuel injection pump is malfunctioning.	Replace the fuel pump. Refer to the Troubleshooting and Repair manual, Bulletin Number 3666418.
	
Raw fuel in the intake manifold (external source).	Check the intake manifold for fuel. Locate the fuel sources and repair as necessary.
	

Excessive White Exhaust Smoke (Cont)

Cause	Correction
Coolant is leaking into the combustion chamber.	Check for head gasket leaks, cylinder head or block cracks.
	
Front gear train is not aligned properly.	Align the match marks of the idler gear, crankshaft gear, camshaft gear and fuel pump gears. Refer to the Troubleshooting and Repair Manual, Bulletin Number 3666418.
	
Internal engine damage.	Analyze the oil and inspect the filter to locate the area of probable damage.
	
Contact an Authorized Cummins Repair Facility.	

Excessive Black Exhaust Smoke

Cause	Correction
Engine is being lugged down.	Increase pump suction head or decrease pump discharge head.
	
Clogged air cleaner element.	Clean or replace the air cleaner element.
	
Muffler is crushed or clogged.	Replace the muffler. Refer to the OEM's service manual.
	
Air leakage between the turbocharger and head.	Tighten the clamp between turbocharger and head. Repair leaks between turbocharger and head.
	
Exhaust leak between turbocharger and exhaust manifold.	Inspect and change gaskets.
	
Turbocharger does not rotate freely.	Replace the turbocharger.
	
Defective or clogged injection nozzle.	Replace the defective or clogged injection nozzle.
	
Injection pump is adjusted incorrectly causing excessive injection.	Adjust or replace the injection pump.
	

Excessive Black Exhaust Smoke (Cont)

Cause	Correction
Incorrect injection timing.	Adjust injection timing.
	
Overhead adjustments are not correct.	Measure and adjust the overhead settings.
	
Contact an Authorized Cummins Repair Facility.	

Fuel Consumption Is Excessive

Cause	Correction
Fuel is leaking.	Check the fuel lines, fuel connections, and fuel filters for leaks. Check the fuel lines to the supply tanks. Repair any leaks.
OK ↓	
Poor-quality fuel is being used.	Assure good-quality No. 2 diesel fuel is being used. Refer to Fuel Recommendations and Specifications in Section 10.
OK ↓	
Intake or exhaust restriction.	Refer to troubleshooting logic for Exhaust Smoke Excessive Under Load in this section.
OK ↓	
Defective or clogged injection nozzle.	Replace the defective or clogged injection nozzle. Refer to instructions in Section 7.
OK ↓	
Incorrect injection timing.	Adjust injection timing. Refer to instructions in Section 7.
OK ↓	
Injection pump is adjusted incorrectly causing excessive injection.	Adjust or replace the injection pump. Refer to instructions in Section 7.
OK ↓	
Hour meter is not calibrated.	Check the hour meter. Calibrate or replace the hour meter if necessary.
OK ↓	

Fuel Consumption Is Excessive (Cont)

Cause	Correction
Air intake or exhaust leaks.	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Repair any leaks. Refer to instructions in Section 7.
	
Air intake system restriction is above specification.	Check the air intake system for restriction. Refer to Check Air Cleaner Service Indicator in Section 5. Replace the air filter as necessary.
	
Lubricating oil level above specification.	Check the oil level. Refer to Check Engine Oil Level in Section 5. Drain excess oil and correct the deficiency in maintenance processes.
	
Contact an Authorized Cummins Repair Facility.	

Fuel or Lubricating Oil Leaking From Exhaust Manifold

Cause	Correction
Intake air restriction is high.	Check the air intake system for restriction. Refer to Check Air Cleaner Service Indicator in Section 5. Replace the air filter if required.
	
Turbocharger drain line is restricted.	Remove the turbocharger drain line and check for restriction. Refer to instructions in Section 7. If required, clean or replace the drain line.
	
Turbocharger oil seal is leaking.	Check the turbocharger for oil seals and for leaks. Refer to the Turbocharger Leaks Engine Oil or Fuel symptom tree in this section.
	
Contact an Authorized Cummins Repair Facility.	

Lubricating Oil Contaminated

NOTE: If excessive sludge is present in the oilpan, refer to Lubricating Oil Sludge in the Crankcase Excessive in this section.

Cause	Correction
Bulk oil supply is contaminated.	Check the bulk oil supply. Replace it is necessary. Refer to Lubricating Oil Recommendations and Specifications in Section 10. Drain the oil and replace with non-contaminated oil. Also, replace the oil filter. Refer to Change Lubricating Oil and Filters in Section 7.
	
Fuel is present in the lubricating oil.	Refer to the Fuel in Lubricating Oil symptom tree.
	
Coolant is present in the lubricating oil.	Refer to the Coolant in Lubricating Oil symptom tree in this section.
	
Metal is present in the lubricating oil.	Contact an Authorized Cummins Repair Facility.
	
Identify unknown lubricating oil contamination.	Analyze the oil and inspect the filters to identify the contamination.
	
Contact an Authorized Cummins Repair Facility.	

Lubricating Oil Consumption Excessive

Cause	Correction
Lubricating oil leak (external).	Inspect the engine for external oil leaks. Tighten the capscrews, pipe plugs, and fittings. Replace the gaskets if necessary.
	
Intake system is contaminated with dust.	Remove and clean intake manifold.
	
Dipstick is not calibrated correctly.	Verify the dipstick is correctly marked.
	
Breather or breather hose is clogged.	Clean the breather and breather hose.
	
Turbocharger compressor or turbine oil seal is leaking.	Replace the compressor or turbine seal.
	
Rear crankshaft seal or seal surface is damaged.	Repair or replace seal and surface.
	
Valve stem, guide, or seal is damaged.	Repair or replace the damaged component.
	
Worn or broken piston ring or cylinder.	Replace the worn or broken piston ring or cylinder.
	
Contact an Authorized Cummins Repair Facility.	

Lubricating Oil Pressure High

Cause	Correction
Engine is cold.	Allow the engine to warm to operating temperature. If the engine will not reach operating temperature, refer to the Coolant Temperature Below Normal (Engine Running) symptom tree in this section.
OK	
Lubricating oil viscosity not correct.	Drain the oil and replace the oil filter. Refer to Change Lubricating Oil and Filters in Section 7. Use the correct oil. Refer to Lubricating Oil Recommendations and Specifications in Section 10.
OK	
Lubricating oil filter is not correct.	Replace the oil filter. Refer to Change Lubricating Oil and Filters in Section 7. Use the correct oil filter. Refer to Lubricating Oil Recommendations and Specifications in Section 10.
OK	
The pressure gauge is malfunctioning.	Install a temporary pressure gauge at main oil rifle. Compare the indications with the engine running. If required, replace the pressure sender. Refer to Lubricating Oil Pressure Sensor, OEM (007-052) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02. If required, replace the pressure gauge. Refer to Oil Pressure Gauge Removal/ Installation in Section 7.
OK	
Pressure regulator valve has malfunctioned.	Check and replace valve. Refer to Lubricating Oil Pressure Regulator (Main Rifle) (007-029) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
OK	

Lubricating Oil Pressure High (Cont)

Lubricating oil pump installation not correct.	Verify that the correct lubricating oil pump and o-rings are installed. Refer to Lubricating Oil Pump (007-031) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Contact an Authorized Cummins Repair Facility.	

Lubricating Oil Pressure Low

Cause	Correction
Lubricating oil level is below specification.	Check the oil level. Verify the dipstick calibration and the oil pan capacity. Fill the system to the specified level.
OK	
Oil level or oil pressure sensor is damaged.	Replace the oil level or oil pressure sensor.
OK	
Lubricating oil filter is clogged.	Replace the filter.
OK	
Fuel or coolant is in the lubricating oil.	Refer to Oil Level Rises symptom tree.
OK	
Regulator or relief valve is not adjusted correctly.	Adjust the regulator or relief valve.
OK	
Lubricating oil pan strainer is clogged.	Clean the strainer.
OK	
Lubricating oil suction tube is damaged.	Repair or replace the suction tube.
OK	
Lubricating oil pump is damaged.	Replace the oil pump.
OK	
Main or rod bearing is worn or damaged.	Replace the bearing.
OK	
Contact an Authorized Cummins Repair Facility.	

Oil Level Rises

NOTE: Oil level may increase due to thermal expansion as the engine warms up and then decrease as the engine cools down. Slight variations due to temperature changes are normal.

Cause	Correction
Excessive oil has been added to the engine.	Drain the excess oil. Refer to Change Lubricating Oil and Filters in Section 7.
	
Fuel is leaking into the oil system.	Troubleshoot as per Lubricating Oil Contaminated in this section.
	
Coolant is leaking into the oil system.	Troubleshoot as per Lubricating Oil Contaminated in this section.
	
Contact an Authorized Cummins Repair Facility.	

Lubricating Oil Sludge in the Crankcase Excessive

Cause	Correction
Bulk oil supply is contaminated.	Check the bulk oil supply. Replace it is necessary. Refer to Lubricating Oil Recommendations and Specifications in Section 10. Drain the oil and replace with non-contaminated oil. Also, replace the oil filter. Refer to Change Lubricating Oil and Filters in Section 7.
	
Coolant temperature is below specification.	Refer to the Coolant Temperature Below Normal (Engine Running) symptom tree in this section.
	
Crankcase ventilation system is plugged.	Check and clean the crankcase breather and vent tube. Refer to Crankcase Breather Tube (003-018) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Fuel grade is not correct for the application or the fuel quality is poor.	Operate the engine from a tank of high-quality fuel. Refer to Fuel Recommendations and Specifications in Section 10.
	
Lubricating oil does not meet specifications for operating conditions.	Check the grade and type of oil. Refer to Lubricating Oil Recommendations and Specifications in Section 10. If the wrong type or grade of oil is present, drain and replace it. Refer to Change Lubricating Oil and Filters in Section 7.
	
Lubricating oil drain interval is excessive.	Verify the correct lubricating oil drain interval. Refer to Change Lubricating Oil and Filters in Section 7.
	

Lubricating Oil Sludge in the Crankcase Excessive (Cont)

Lubricating oil is contaminated with coolant or fuel.	Go to the Lubricating Oil Contaminated symptom tree in this section.
	
Crankcase pressure is excessive.	Check for excessive blowby. Refer to the Crankcase Gases (Blowby) Excessive symptom tree in this section.
	
Closed crankcase ventilation hoses are leaking or damaged.	Inspect the closed crankcase ventilation system hoses and connections for leaks, obstruction, or damage. Refer to Closed Crankcase Ventilation Hoses (003-024) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Close crankcase ventilation valve is leaking or malfunctioning.	Inspect the closed crankcase ventilation valve for obstruction or damage. Refer to Closed Crankcase Ventilation Valve (003-023) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Refer to a Cummins Authorized Repair Facility.	

Turbocharger Leaks Engine Oil or Fuel

Cause	Correction
Engine is operating for extended periods under light or no-load conditions (slobbering).	Operate the engine at idle speed for maintenance activities only.
	
Lubricating oil or fuel is entering the turbocharger.	Check the turbocharger for oil or fuel in the piping. Refer to Turbocharger (010-033) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Turbocharger drain line is restricted.	Remove the turbocharger drain line and check for restriction. Clean or replace the drain line. Refer to Turbocharger Oil Drain Line (010-045) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Turbocharger oil supply line is loose or leaking.	Check and tighten oil supply line fitting(s), if necessary. Refer to Turbocharger Oil Supply Line (010-046) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
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Crankcase Gases (Blowby) - Excessive

NOTE: Crankcase gases or blowby may be measured. Refer to Crankcase Blowby, Measure (014-010) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.

Cause	Correction
Cylinder head valve guides are excessively worn.	Check the valve guides for wear. Replace the cylinder head if necessary. Refer to Cylinder Head (002-004) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Pistons or piston rings are worn, damaged, or not correct.	Check the pistons for correct part numbers. Refer to Control Parts List (CPL), Bulletin 3379133 or 4021327. Check the pistons and rings for wear and damage. Refer to Piston (001-043) and Piston Rings (001-047) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Turbocharger oil seal is leaking.	Check the turbocharger compressor and turbine seals. Refer to Turbocharger (010-033) in Troubleshooting and Repair Manual B3.9, B4.5, and B5.9 Series Engines, Bulletin Number 3666087-02.
	
Contact an Authorized Cummins Repair Facility.	

Engine Overspeed Trip

NOTE: An engine overspeed trip occurs when the engine's speed exceeds the value specified on the Factory setting Tag described in Section 2. The trip isolates the fuel supply to the engine and it stops immediately. The trip is indicated on the local control panel and inside the local control panel on the speed switch. Additionally, a trip output is supplied to the fire protection system for remote display.

Cause	Correction
Engine actually operated at too great a speed due to catastrophic load failure such as pipe break, pump mechanical failure, or loss of suction.	Correct the cause of the load failure.
	
Engine actually operated at too great a speed due to configuration error.	Check rated speed setting as specified on the Factory Setting Tag described in Section 2. Refer to Rated Speed Setpoint Adjustment and Testing in Section 3.
	
Overspeed switch is set at too low a setpoint.	Check overspeed speed setting as specified on the Factory Setting Tag described in Section 2. Refer to Overspeed Setpoint Adjustment and Testing in Section 3.
	
Speed switch wiring failure has occurred.	Check continuity and insulation from ground for the signal power wiring and ground wiring to the speed switch. Refer to Drawing 10423 Sheet 1 in Section 13. Replace defective components and repair electrical faults.
	
Speed switch failure has occurred.	If the speed switch fails to operate as per Overspeed Setpoint Adjustment and Testing in Section 3, replace the speed switch. Refer to Overspeed Switch Removal/Installation in Section 7.
	
Contact an Authorized Cummins Repair Facility.	

Tachometer Does Not Indicate Engine Speed

Cause	Correction
Fuse F4 has opened.	If required, replace Fuse F4. Locate and correct the electrical fault that caused the fuse to operate. Refer to Drawing 10423 Sheet 1 in Section 13.
OK	
An electrical fault exists in the tachometer power and grounding circuits.	Check continuity and insulation from ground for the power wiring and ground wiring to the tachometer. Refer to Drawing 10423 Sheet 1 in Section 13. Replace defective components and repair electrical faults.
OK	
An electrical fault exists in the speed sensor input circuit. This fault may also cause a failure in the crank terminate signal to the fire protection system.	Check continuity and insulation from ground for the speed sensor circuit. Refer to Drawing 10423 Sheet 1 in Section 13. Replace defective components and repair electrical faults.
OK	
The speed sensor has failed.	With the engine running, check the signal from the speed sensor with an oscilloscope or pulse counter. Replace the speed sensor is it has failed. Refer to Speed Sensor Removal/Installation in Section 7.
OK	
The tachometer has failed.	Check the operation of the tachometer with a pulse generator. Replace the tachometer is it has failed. Refer to Tachometer Removal/Installation in Section 7.
OK	
Contact an Authorized Cummins Repair Facility.	